International Journal of Surgery Case Reports 2 (2011) 4–5

International Journal of Surgery Case Reports

journal homepage: www.elsevier.com/locate/ijscr

Case report

The sentinel placement of an open abdomen negative pressure unit

Alexander Zuriarrain[a,*], Andrew Shay[a], Gerald Demarest[b]

[a] PGY-2 Surgical Resident at the University of New Mexico (UNM), United States
[b] Department of Trauma Surgery at UNM, United States

ARTICLE INFO

Article history:
Received 1 October 2010
Accepted 20 October 2010
Available online 19 November 2010

Keywords:
Open abdomen
Trauma
Negative pressure units
Abdominal closure

ABSTRACT

The open abdomen is a common condition after a trauma necessitating celiotomy with the inability to close the fascia either due to damage control surgery or abdominal compartment syndrome. Traditionally the open abdomen has been approached with the use of the open abdomen temporary abdominal closure (Barker Vacuum Pack Dressing). More recently there has been the addition of the ABThera™ open abdomen negative pressure unit introduced by KCI. Our case report is based on the first patient to have placement of the ABThera™ device.

1. Case presentation

A 52 year old male presented to the University of New Mexico level I trauma center after having been assaulted by an unidentified blunt object. A witness to the event stated the patient had been consuming alcohol considerably over the course of a few hours prior to the event. Emergency Medical Services (EMS) arrived on the scene and discovered the patient on the ground with a decreased level of consciousness. The EMS team noted the smell of alcohol as well as a deformity on the left aspect of the patient's chest as well as significant facial trauma. After a 45 min transport time the patient arrived to the trauma center.

During the primary assessment the patient was found to have a Glascow Coma Scale (GCS) of less than 8 and was immediately intubated. After the secondary assessment the patient was transported to radiology where he received a Computerized Axial Tomography (CT scan) of his abdomen and pelvis. This demonstrated free retroperitoneal fluid as well as free extravasation of contrast into the abdomen suggesting visceral perforation. The patient was immediately taken to the operating room for an exploratory laparotomy (Figs. 1 and 2).

Intra-operatively he was found to have a left renal laceration, retroperitoneal hematoma, and peri-splenic arterial bleeding. He had primary repair of the left renal laceration as well as primary repair of the peri-splenic venous and arterial vessels. Due to the high likelihood of development of abdominal compartment syndrome the attending surgeon placed a temporary abdominal closure (TAC). This consisted of a plastic barrier over the intestines, a burn flap gauze dressing with two nasogastric tubes as well as a sterile towel and Ioban™ placed over the abdominal wall.

The patient was transported to the Trauma Surgical Intensive Care Unit, where he continued to experience intra-abdominal bleeding. He subsequently required a left nephrectomy, splenectomy, distal pancreatectomy with placement of the ABThera™ device. On hospital day number 8 the patient had fascial closure through the use of a 30 cm × 30 cm piece of Vicryl mesh.

2. Discussion

Historically the immediate closure of the trauma celiotomy resulted in abdominal compartment syndrome (ACS). In the recent years this was noted to be a significant cause of mortality. The standard treatment for ACS is to leave the abdomen open until bowel edema has decreased and the fascia can be approximated.[6]

Management of the open abdomen creates significant challenges for surgeons. Potential problems of the open abdomen include multi-organ dysfunction, bowel edema and fistulas.[2] After resolution of the initial injury the loss of abdominal integrity can be severe.[10] Historically several temporary abdominal closures (TACs) have been used without evidence based justification for choosing one modality over another. The use of particular TACs has been determined mainly by surgeon's preference. The ideal TAC system would allow for frequent re-exploration preserving fascial domain and assisting in the approximation of tissue to enhance eventual closure.[1] Incorporated into the use of a particular TAC is the economic impact including ICU length of stay, mortality, fistula formation and cosmesis.

* Corresponding author at: Department of Surgery, University of New Mexico, 2211 Lomas Blvd NE, Albuquerque, NM 87114, United States. Tel.: +1 305 798 2453.
E-mail addresses: AZuriarrain@salud.unm.edu, Zuri30@yahoo.com (A. Zuriarrain).

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doi:10.1016/j.ijscr.2010.10.001

Fig. 1. Completed placement of AbThera™.

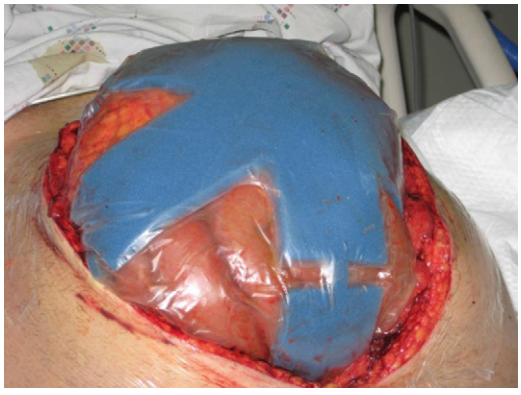

Fig. 2. Step 1 fenestrated foam placement to abdomen.

The original TAC was described as the approximation of skin edges through the use of perforating towel clips.[7] This was followed by the creation of the Bogota bag; using an intra-venous (IV) bag sutured to the skin edges which prevented insensible losses, reduced outside contamination and allowed for the frequent removal and inspection of abdominal contents.[8] The TAC next evolved to the Wittmann Patch whereby an adhesive Velcro-type device was sutured to the fascia which allowed for staged abdominal closure through the application of controlled tension.[5] This unfortunately did not allow removal of intrabdominal fluid leading to the negative pressure therapy devices.[4]

Barker described a vacuum packing technique which has the advantage of protecting the bowel and preserving the fascia.[9] This is considered to be the "traditional TAC" whereby the abdominal contents are protected by a perforated non-adherent material that then has subfascial placement of a sterile towel embedded with two nasogastric tubes.[3] The entire abdominal wall including the tubes, towel and bowel drape are covered by an adhesive material known as Ioban™ (3M) that is placed to continuous wall suction.

This was soon followed by the V.A.C. system created by KCI which used a reticulated polyurethane foam over the plastic covering the bowel with a negative pressure computer controlled vacuum pump. Most recently the creation of the open abdomen negative pressure therapy system (ABTHERA, KCI) was developed to treat the open abdomen. The ABTHERA incorporates variations of vacuum assisted closure through the use of a visceral protected layer composed of foam embedded between two fenestrated non-adherent sheets. This sheet is used to cover the exposed abdominal contents with the addition of secondary perforated foam and application of suction through a semi-occlusive drape. This system is powered by a portable suction unit with a built-in canister to quantify abdominal fluid output.

Conflicts of interest statement

None.

Funding

None.

Ethical approval statement

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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